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DBR-667-5

26 May 1971

wcm

Proposal to add Precision Stereo Recorder to
Vibration investigation, Contract #

Reference ① Contract

② Proposal DBR-667-4 dated 21 March 1971

Gentlemen:

In accordance with our conversations we submit our proposal to add the Precision Stereo Recorder to the equipments being investigated under the reference ① contract and detailed in the reference ② proposal, Phase I.

The additional effort is estimated to be equivalent to that required for two of the other equipments because of the complexity of the supports and the several optical systems in the device.

We estimate an additional cost of STAT including fee of STAT for the additional Phase I task. From the scheduled completion and availability of the Precision Stereo Recorder which, we understand, will occur after 15 July 1971 it is obvious we cannot combine trips and consequently plan to return late in July to investigate the unit.

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We estimate the initial measurement effort will require one full week's access to the Precision Stereo Recorder, with customer furnished operator assistance during that time. It is probable we will need additional access for up to three days, two to three weeks later as well.

On this basis we propose that funds be added to the contract and the period of performance be extended by six weeks to cover the additional effort. The work statement of Phase I and the deliverable items of the existing contract describe the additional effort proposed.

very truly yours

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4 June 1971

Second Interim Report
Cure of Vibration Difficulties
on Optical Equipment

Period of Report 24 May through
4 June 1971

1.0 General

The investigation, at the site, of the five chosen instruments was completed during this period. After data reduction and analysis it may prove necessary to conduct some additional measurements. This will be determined during the analytical effort in the next period.

Following is a brief log of the vibration measurement effort during this period.

1.1 MANN COMPARATOR (TYPE 1210) S/N 104

From 24 May thru 25 May 1971 vibration measurements were made on the 1210 Comparator

1.2 MANN SCANNING MICRODENSITOMETER (TYPE 1032T)
S/N 07

From 26 May thru first half of 28 May 1971 vibration measurements were made on the Microdensitometer

1.3 Beacon Enlarger, S/N 001

From last half of 28 May thru first half of 2 June 1971 vibration measurements were conducted.

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4 June 1971

Second Interim Report - Vibration Difficulties1.4. DUAL VIEWING MICROSTEREOSCOPE, MOD. II, S/N 4

Vibration measurements were conducted from last half of 2 June thru 3 June 1971

1.5

REPORT

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attended the

meeting with [redacted] on the afternoon of 27 May 1971

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1.6 HIGH PRECISION STEREO COMPARTOR - QUICK CHECK

a quick check of the ambient vibration on the seismic block, the isolated granite base and the instrument stage, was made on the afternoon of 28 May 1971

1.7 Proposal to add HIGH PRECISION STEREO COMPARTOR TO CONTRACT

As requested, a proposal was submitted on 27 May 1971 to cover an investigation of this unit, which can be initiated after 15 July 1971 if desired.

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A brief summary of the investigations follows:

2.1 MANN 1210 COMPARATOR - INVESTIGATION

The ambient floor vibration was relatively quiet in this room. The card punch and teletype added about 50% to the ambient level. Door closing impulses resulted in vibration amplitudes about 8X higher than ambient.

Vibration levels at various points on the unit along X, Y & Z directions were measured and spectral analyses were manually made in 5 Hz steps up to 100 Hz and 10 Hz steps to 200 Hz.

The floor pads under the unit resulted in magnification of 2X to 3X below 40 Hz and attenuated input at higher frequencies except for 120 Hz where they magnified 2X (this could be caused by the on-board fluorescent ballasts).

A significant resonance off the eye piece in a transverse direction was observed with a 9X magnification of the motion at 44 Hz. The unit appeared to be relatively quiet and the significance to performance must await the reduction of the extensive data taken.

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4 June 71Second Stereum ReportVibration Difficulties2.2 MICRODENSITOMETER - 1032T, 3/4 07

The ambient floor vibration in the clean room was relatively high, caused primarily by the clean room air circulating fans. Initially with fans "ON" the vibration level at the floor was 3X to 4X higher than with fans "OFF." Part way through the investigation new fan belts were installed. As seen at the platen of the unit the vibration level with fans "ON" dropped to $\frac{1}{10}$ the former value before belt change. This illustrates the sensitivity of vibration disturbance on-board instruments to the condition of adjacent rotary machinery.

The response of various parts of the unit in X, Y & Z directions were measured and manual spectral analyses made. The most significant resonance discovered was transverse (X) at the platen at 30 Hz.

The vibration isolation pad and the isolators between the base and the machine were measured for natural frequency & damping. Both are quite non-linear and transmit and magnify some of the disturbing frequencies.

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4 June 1971

Second Interim Report
Vibration Difficulties

2.2 (cont.)

Measurements were taken so that correlation can be made between platen vibration relative to the lens and density readings.

The evaluation of the effect of vibration on the performance of the unit and recommendations for improvements to vibration isolation, if any, must await full data reduction and analysis.

2.3 BEACON ENLARGER, S/N 001

The ambient floor vibration was typical for the area. There was a higher amplitude of 60 Hz disturbance than normal, presumably due to the large fan that provides vacuum for the easel.

Ambient vibrations were measured at the floor, mount pad, lens holder and easel in the X, Y & Z directions. Manual spectral analyses were made of these responses.

The natural frequency of the vibration isolators and damping ratios were measured.

The floor was driven at 10 Hz,

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Second Interim Report
Vibration Difficulties

2.3 (cont.)

at the predicted worst case amplitude
() The response at ^{STAT}
the 'lens mount was measured in
the X, Y & Z directions. This test
was repeated driving the floor
up to the resonant frequencies
of the mounts which ranged from
13 to $15\frac{1}{2}$ Hz depending on the
position of the easel.

No significant magnifications of
vibration disturbance were discovered.
The vibration isolation system is adequate.
 cursory examination of the data
indicates no limitation of performance
will be experienced with this machine
under predicted worst case vibrations.

2.4 Dual Viewing MICROSTEREOSCOPE

The ambient floor vibration in the
T&EB Laboratory (4th floor) was $1\frac{1}{2} \times$ to
 $2 \times$ the levels measured in the other
areas. This disturbance increase
is mostly due to 10 Hz and 20 Hz
building vibrations apparently caused
by external sources. This was about
half of the predicted worst case amplitude.

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Second Interim Report Vibration Difficulties

2.4 (cont.)

ambient vibration responses of the instrument were measured at various locations both with the table normally wheel mounted and with wheels removed. This ruled out possible degrading effects of the wheel mounting.

The floor was driven to predicted worst case amplitude, and higher. The instrument performance was monitored with a calibrated graticule at full 75X image magnification. Performance was measured under ambient building and operator induced disturbances.

Two significant resonances were discovered which materially degrade performance. These were a front-to-back vibration of the platen at 18 Hz and a rocking of the microscope support structure on its three-point suspension at 25 Hz. A quick fix with gum tape on the platen made major improvement. A wedge under a corner of the microscope support made further improvement. A better analysis will result from the plate reduction.

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Second Interim Report
Vibration Difficulties

3.0 Program Next Period

The data acquisition activity is substantially complete except for the expected need for additional or confirmation measurements that will be determined during data reduction.

The next three to four weeks will cover the data reduction and analysis activity. An initial report will be written.

After completing the measurement of any final data during the next trip now tentatively scheduled for early July a final report will be submitted.